APPARATUS AND METHOD FOR ACQUIRING IMAGE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority from Korean Patent Application No. 10-2015-0144320, filed on Oct. 15, 2015, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND

1. Field

[0002] Apparatuses and methods consistent with exemplary embodiments relate to apparatuses and methods for acquiring an image, and more particularly, to image acquisition apparatuses and methods capable of acquiring high-resolution color image information.

2. Description of the Related Art

[0003] A color filter in an image sensor is an element needed to acquire color information of an image. In most color image sensors, an organic dye-type color filter through which only specific color of red (R), green (G), and blue (B) lights passes is located on a detector for photoelectric conversion for each pixel in an arrangement called a Bayer pattern, and an original color image is restored through image processing after obtaining an image in a color mosaic scheme through such Bayer color filters.

[0004] A color filter applied to image sensors and the like to acquire a color image uses a scheme of obtaining color information of an image by spatially separating colors, and thus, resolution of information for each color is reduced.

[0005] For example, in case of a Bayer color filter, resolution of information for each color is reduced to one fourth of the number of detectors (for R or B color) or by a half thereof (for G color). When a Bayer color filter is applied, since information about R and B colors is obtained for each basic unit forming a Bayer pattern, i.e., a unit of 2 pixels×2 pixels, information corresponding to a half of the number of detectors is obtained in each of horizontal and vertical directions, and thus resolution corresponding to one fourth of the total number of detectors is obtained for each of R and B colors. Since information about a G color is obtained from two pixels in a unit of 2 pixels×2 pixels, resolution of the G color is two times the resolution of the R or B color, but information about the G color cannot be obtained from R and B regions yet, and resolution corresponding to a half of the total number of detectors is obtained for the G color.

SUMMARY

[0006] Provided are an image acquisition apparatus and an image acquisition method capable of acquiring a high-resolution color image by applying an optical path modulation optical element to shift an optical path of an image.

[0007] Additional aspects will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the presented exemplary embodiments.

[0008] According to an aspect of an exemplary embodiment, an image acquisition apparatus includes: a color filter on which a plurality of types of color filter elements are arranged; an optical path modulation optical element configured to shift an incident position of an image on the color filter by electrically modulating an optical path; a photoelectric conversion cell array configured to acquire image information for each color by detecting, in pixel units, light which has passed through the color filter; and a signal processor configured to acquire, in a time division manner, the image information for each color of the image of which a position is changed by the optical path modulation optical element by using a detection signal of the photoelectric conversion cell array, and configured to obtain a color image by combining the acquired image information for each color.

[0009] The optical path modulation optical element may be further configured to shift the incident position of the image on the color filter in one pixel unit, and the signal processor may be further configured to acquire, in the time division manner, the image information for each color of the image of which a position is changed in one pixel unit by the optical path modulation optical element.

[0010] The image acquisition apparatus may further include a driver configured to electrically drive the optical path modulation optical element such that the position of the image is changed on the color filter in the time division manner.

[0011] The optical path modulation optical element may be an electrowetting prism of which an inclination angle of an interface between a first fluid and a second fluid is controlled by an applied voltage.

[0012] An incident surface and an exit surface of the electrowetting prism may be parallel to each other.

[0013] The electrowetting prism may include first and second electrowetting prisms, each provided with the first and second fluids, and the first and second electrowetting prisms may be arranged along a traveling direction of the light such that one of the first or second fluids of the first electrowetting prism and one of the first or second fluids of the second electrowetting prism, having a same refractive index, are close to each other.

[0014] When an interface between the first and second fluids in the first electrowetting prism is a first interface, and an interface between the first and second fluids in the second electrowetting prism is a second interface, the first interface and the second interface may be parallel to each other.

[0015] The optical path modulation optical element may include at least one active liquid crystal element configured to shift the light according to an applied voltage.

[0016] The active liquid crystal element may include a first active liquid crystal element disposed along the traveling direction of the light and configured to refract the light according to the applied voltage.

[0017] The active liquid crystal element may include first and second active liquid crystal elements disposed to be spaced apart from each other along the traveling direction of the light and configured to shift the light according to the applied voltage.

[0018] The active liquid crystal element may include at least one of a hologram-type liquid crystal element and a beam-steering liquid crystal element.

[0019] The image acquisition apparatus may further include a main lens, wherein the optical path modulation optical element is located between the main lens and the color filter.